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| 10/774,727 | 02/09/2004 | Martin Behringer | P2001,0573 | 9206 |

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| EXAMINER | |
|---|---|
| LANE, JEFFREY D | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2828 | |

DATE MAILED: 07/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| – | Application No. | Applicant(s) | |
|---|---|---|---|
| **Office Action Summary** | 10/774,727 | BEHRINGER ET AL. | |
| | Examiner | Art Unit | |
| | Jeffrey D. Lane | 2828 | |

*– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *26 April 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2, 12 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Scobey et al. (WO 97/30495).

As for claim 1 Scobey discloses in figure 7, A device for emission of laser radiation, comprising: at least one semiconductor laser 58 and 68 having: a resonator (between 60 and 72); and a pumped active zone 58 and 68 disposed within said resonator, said zone being subdivided into at least two spatially separated active zones by free-radiation regions without lateral wave guidance (between 64 and 76*), said zone being subdivided such that higher modes of said resonator experience a smaller amplification per resonator circulation than a fundamental mode of said resonator* 80 (See pg 22 lines 6 and 7; and page 15 lines 16-19).

As for claim 2 Scobey discloses in figure 7, The device according to claim 1, wherein: said at least one semiconductor laser is at least two semiconductor lasers 58 and 68; said semiconductor lasers: have at least one end; are disposed in series (See page 22 lines 5-17); and have sides and an antireflection-coating at least on one of said

sides 64 and 77; said semiconductor lasers have outer mirror elements 60 and 70 at said end of said semiconductor lasers 58 and 68 disposed in series; and said outer mirror elements 64 and 77 forms said resonator.

As for claim 12 Scobey discloses in figure 7, a frequency-selective element 80 (see Page 22 lines 15-16) disposed in at least one of said free-radiating regions.

As for claim 16 Scobey discloses all that pertains to claim 1, see above. Scobey further discloses at least one of said free-radiating regions 79 is formed of a medium having a low absorption coefficient. Scobey explains "Various components of Fig. 7 shown spaced apart can advantageously be butt coupled..." (Page 22 line 20). Scobey further explains, "The monolithic prism assembly comprises a transparent substrate..." (Page 5 lines 1-2). Since the free-radiation region is transparent it would also have a low absorption coefficient by definition.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 2, 9-11, 14, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawaguchi (US 5,220,572) in view of Smith (US 4805185).

As for claim 1 Kawaguchi discloses in figure 3, A device for emission of laser radiation, comprising: at least one semiconductor laser 11 and 12 (See column 2 lines 27-28) having: a resonator L (See column 2 lines 45-47); and a pumped active zone 11 and 12 disposed within said resonator L, said zone being subdivided into at least two spatially separated active zones by free-radiation regions without lateral wave guidance (figure 3 shows light passing through a lens but not through a wave guide), however Kawaguchi does not explicitly disclose higher modes of resonator experience a smaller amplification. Smith discloses, "The imposition of the three Fabry Perot resonance conditions virtually eliminates side modes above the diode lasing threshold bias and establishes one of the diodes natural Fabry Perot wavelengths as the dominant emission mode. This is because the lasing threshold of the dominant mode is lowered as a result of its higher reflectivity which promotes increased stimulated emissions in phase with the dominant mode." (3/56-60). Therefore it would have been obvious to one of ordinary skill in the art to use a Fabry Perot etalon to eliminate side modes.

As for claim 2 Kawaguchi discloses in figure 3, The device according to claim 1, wherein: said at least one semiconductor laser is at least two semiconductor lasers 11 and 12; said semiconductor lasers: have at least one end; are disposed in series (illustrated by showing light traveling from one into the other); and have sides and an antireflection-coating at least on one of said sides (See column 2 lines 29-32); said semiconductor lasers have outer mirror elements 11a and 12a at said end of said semiconductor lasers 11 and 12 disposed in series; and said outer mirror elements 11a and 12a forms said resonator.

As for claim 9, Kawaguchi discloses in figure 3 the optical axis of the laser are the same and therefor parallel to one another.

As for claims 10 and 11, Kawaguchi discloses that the formula of f = c/2L is used to determine the length of his cavity (See Column 1 lines 31-33). Kawaguchi further discloses, "As is apparent from these figures, the shortest light pulse, which is about 7 ps in pulse width and has a frequency of 1 GHz" (Column 3 lines 49-51). Using the numbers in the formula Kawaguchi gives to determine the length of the device, give a length that falls between 1 μm and 10 m.

As for claim 14, Kawaguchi discloses, an imaging optical element 13 disposed in at least one of said free-radiating regions.

As for claim 21, Kawaguchi discloses in figure 3, In a semiconductor laser, an emission device for emitting laser radiation, comprising: a resonator; and a pumped active zone disposed within said resonator, said zone being subdivided into at least two spatially separated active zones by free-radiation regions without lateral wave guidance, however Kawaguchi does not explicitly disclose higher modes of resonator experience a smaller amplification. Smith discloses, "The imposition of the three Fabry Perot resonance conditions virtually eliminates side modes above the diode lasing threshold bias and establishes one of the diodes natural Fabry Perot wavelengths as the dominant emission mode. This is because the lasing threshold of the dominant mode is lowered as a result of its higher reflectivity which promotes increased stimulated emissions in phase with the dominant mode." (3/56-60). Therefore it would have been

obvious to one of ordinary skill in the art to use a Fabry Perot etalon to eliminate side modes.

5. Claims 3 and 4 rejected under 35 U.S.C. 103(a) as being unpatentable over Kawaguchi (US 5,220,572) and Smith (US 4805185) in view of Hsu et al. (US 6,263,002).

Kawaguchi and Smith disclose all that pertains to claim 2. However, neither Kawaguchi nor Smith disclose using surface emitting lasers. Hsu discloses, " Vertical-cavity surface-emitting lasers (VCSELs) have recently received considerable attention because their unique structure offers several significant advantages over conventional edge-emitting lasers ... These advantages include ... the convenience of full-scale on-wafer probe test before separation into chips...." (Column 1 lines-8-27) There fore it would have been obvious to one of ordinary skill in the art to use a vertical-cavity surface emitting lasers to able to test it on the chip.

6. Claims 5, 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawaguchi (US 5,220,572) and Smith (US 4805185) in view of Weller et al. (US 5,136,598).

Kawaguchi and Smith discloses all that pertains to claim 2. However neither Kawaguchi nor Smith disclose using a broad stripe laser. Weller discloses, "the output power level in discrete devices probably will not go much higher than a few hundred milliwatts, which is the reason why laser diode arrays and broad stripe lasers have been

developed."(Column 1 lines 18-22). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a broad stripe laser in Kawaguchi's device so that an output power over a few hundred milliwatts can be obtained.

7. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kawaguchi (US 5,220,572) and Smith (US 4805185) in view of Weller et al. (US 5,136,598) as applied to claim 5 above, and further in view of Kasarinov et al. (US 6,580,850).

Kawaguchi, Smith and Weller disclose all that pertains to claim 5, see above. Kawaguchi further discloses, at least one of said broad-stripe lasers have an exit window 11b and an active zone 11 defining an active zone plane and an imaging optical element 13 is disposed in at least one of said free-radiating regions at said exit window 11b. However, neither Kawaguchi, Smith, nor Weller disclose using a cylindrical lens. Kasarinov discloses, "A mode transformer embodying the invention can be used, in combination with the laser and a cylindrical lens, to stabilize the laser output in the fundamental mode and to couple it efficiently into a single mode fiber." (Column 1 lines 18-22). Therefor it would have been obvious to one of ordinary skill in the art at the time of the invention to use a cylindrical lens in Kawaguchi's device to stabilize the laser output and to couple it efficiently.

8. Claims 5, 6, 18, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scobey (WO 97/30495) in view of Weller et al. (US 5,136,598).

As for claims 5 and 6 Scobey discloses all that pertains to claim 2. However Scobey does not disclose using a broad stripe laser. Weller discloses, " the output power level in discrete devices probably will not go much higher than a few hundred milliwatts, which is the reason why laser diode arrays and broad stripe lasers have been developed."(Column 1 lines 18-22). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a broad stripe laser in Scobey's device so that an output power over a few hundred milliwatts can be obtained.

As for claim 18 Scobey and Weller disclose all that pertains to claim 5, see above. Scobey further explains wherein: said pump zone has a band gap (see page 4 line 23); and at least one of said free-radiating regions is formed of a section having a band gap (see page 10 line 24- page 11 line2) greater than said band gap in said pump zone. InGaAsP (pump zone) has a band gap of 0.95 eV. BK7 (free radiation region) has a band gap of 8.47 eV.

As for claim 19, Scobey discloses all that pertains to claim 16. Scobey further describes in figure 7, wherein: said pump zone has a band gap (see page 4 line 23); said semiconductor lasers 58 and 68 disposed at a distance from one another and have antireflection-coated end faces 64 and 76 facing one another; and at least one of said free-radiating regions 80 is formed of a section with a band gap (see page 10 line 24-page 11 line2) greater than said band gap in the pump zone (see page 4 line 23). However Scobey does not disclose using a broad stripe laser. Weller discloses, " the

output power level in discrete devices probably will not go much higher than a few hundred milliwatts, which is the reason why laser diode arrays and broad stripe lasers have been developed."(Column 1 lines 18-22). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a broad stripe laser in Scobey's device so that an output power over a few hundred milliwatts can be obtained. InGaAsP (pump zone) has a band gap of 0.95 eV. BK7 (free radiation region) has a band gap of 8.47 eV.

9. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scobey et al. (WO 97/30495) and Weller et al. (US 5,136,598) as applied to claim 5 above, and further in view of Stegmuller (US 6,263,140). Scobey and Weller disclose all that pertains to claim 5, See above. Scobey also discloses using an InGaAsP diode laser (See page 4 line 23). However Scobey does not explicitly disclose the InGaAsP is formed on a substrate. It is standard procedure to form InGaAsP laser diodes on substrates, as evidenced by Stegmuller. See Column 2 lines 18-23.

10. Claim 13 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Scobey et al. (WO 97/30495). Scobey discloses all that pertains to claim 12, see above. Scobey further explains "a Bragg grating is etched in the active region of the Fabry-Perot laser..." (Page 1 lines 25-26)

11. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Scobey et al. (WO 97/30495) as evidenced by Stegmuller (US 6,263,140). Scobey discloses all that pertains to claim 1, see above, Scobey further discloses a laser with at least one of said free-radiating regions being formed of a medium having an absorption coefficient (see page 10 line 24- page 11 line2) less than at least one of the group consisting of an adjoining region (see page 4 line 23). A physical property of InGaAsP is it has an absorption coefficient of $1 \times 10^{4}$ $cm^{-1}$. A physical property of BK7 is it has an absorption coefficient of $3 \times 10^{-6}$ $cm^{-1}$. Therefore the device has a medium (BK7) with an absorption coefficient less than the adjoining region (InGaAsP). However Scobey does not explicitly disclose the InGaAsP is formed on a substrate. It is standard procedure to form InGaAsP laser diodes on substrates, as evidenced by Stegmuller. See Column 2 lines 18-23.

12. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Scobey et al. (WO 97/30495) and Stegmuller (US 6,263,140) as applied to claim 17 above, and further in view of Weller et al. (US 5,136,598). Scobey further discloses in figure 7 a device where the pump zone has a band gap (see page 4 line 23); the semiconductor lasers 58 and 68 are disposed at a distance from one another and have antireflection-coated end faces 64 and 76 facing one another; and at least one of said free-radiating regions is formed of a section with a band gap (see page 10 line 24- page 11 line2) greater than said band gap in the pump zone (see page 4 line 23). InGaAsP (pump zone) has a band gap of 0.95 eV. BK7 (free radiation region) has a band gap of 8.47

eV. However Scobey does not disclose using a broad stripe laser. Weller discloses, " the output power level in discrete devices probably will not go much higher than a few hundred milliwatts, which is the reason why laser diode arrays and broad stripe lasers have been developed."(Column 1 lines 18-22). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a broad stripe laser in Scobey's device so that an output power over a few hundred milliwatts can be obtained.

***Conclusion***

13. The numerical values for the properties of band gap and absorption coefficient for BK7 and InGaAsP can be found at the following documents: Gosh, Gorachand et al. "Temperature dispersion of refractive indices of BK7 and SF6 glasses" Lasers and Electro-Optics, 1997. CLEO/Pacific Rim 97. pgs 197-198. Marcano, A. et al. "High-sensitivity absorption measurement in water and glass samples using a mode-mismatched pump-probe thermal lens method" Applied Physics Letters, Vol. 78 No. 22, 2001, pgs 3415-3417. (Specifically see abstract). Kuhara et al. (US 6,483,161) Specifically see column 12 lines 42-43. Takiguchi et al. (US 5,544,188) Specifically see table 3.

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

***Response to Arguments***

15. Applicant's arguments filed 4/26/06 have been fully considered but they are not persuasive.

16. Scobey discloses only amplifying only the fundamental mode (page 15 lines 16-19). The limitations of "<The> transversal modes of higher order are suppressed by adapting the free-radiation regions" nor "configuring the distance between the diode lasers" are not required by the amended claims. Those skilled in the art focus on ways to improve quality.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrey D. Lane whose telephone number is (571) 272-1676. The examiner can normally be reached on Monday thru Friday 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jeffrey D Lane
Examiner
Art Unit 2828

JDL

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PRIMARY EXAMINER